To: Ford, Robert[Ford.Robert@epa.gov]
From: Acree, Steven
Sent: Mon 8/7/2017 4:34:51 PM
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Nope. Based on your quote, you are interpreting correctly and I was giving them too much credit. The issue is the 9 ft/d bulk K for the bedrock. That seems to me (the Unaided Observer) to be a pretty high number. The model works with average K for a unit, not the K of individual fractures. Estimating a true bulk K for fractured rock from field data is a tough problem as evidenced by all the back-n-forth at Devens. Here, it will likely be the wildest of WAGs. This is the wrong time to go down this road, but it could be insightful to see if the USGS has modeled in this general area and what values they have used for rock. Unfortunately, Phil probably has knowledge that could be useful here.

Steven D. Acree, Hydrologist

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From: Ford, Robert
Sent: Monday, August 07, 2017 11:14 AM
To: Acree, Steven <Acree.Steven@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Here is the statement for the fully enclosed overburden (barrier wall on all sides of property boundary) and a low permeability surface cap:

"In addition, the barrier wall does not prevent the discharge of impacted groundwater from the overburden units to the Acushnet River. Particle flow tracking indicates that vertical communication

between the overburden layers and the underlying bedrock will allow water to flow vertically downward into the bedrock, bypassing underneath the Barrier Wall, before discharging to the

river. The barrier wall does, however, reduce the estimated groundwater flux through the contained overburden by approximately 50 percent. This is due to the more circuitous route groundwater from the overburden

units must take to discharge to the river, as well as the reduced gradients and tidal fluctuations caused by the barrier wall."

I interpret this statement as indicating that 50% of the flux that normally would pass through the overburden will now flow through the bedrock to the river. In other words, the bedrock is an end-around pathway that can convey 50% of the normal groundwater flux that passes through the overburden to the river. They do not post any flux data output from the model; only equipotential heads mapped across vertical cross-sections of the model domain.

Is there a different way to interpret what they are saying?

Some other information on model parameters:

Table 1-1. Hydraulic Conductivity

Unit	Model Layer	Kx,y (ft/day)	Kz (ft/day)
Fill Unit	1	18.1	1.81
Fill Unit where Peat is Present	1	18.1	0.0002834
Glacial Outwash/Till	2	34.1	3.41
Bedrock	3	8.96	8.96

Table 1-8. Transient Properties

Unit	Model Layer	Specific Storage (ft^{-1})	Specific Yield	Effective Porosity
Fill Unit	1	5e-005	0.20	0.30
Glacial Outwash/Till	2	5e-005	0.22	0.25
Bedrock	3	5e-005	0.05	0.10

Robert Ford

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From: Acree, Steven
Sent: Monday, August 07, 2017 11:59 AM
To: Ford, Robert <Ford.Robert@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

The 50% is 50% of what should be a very low calculated flux out of the box, not 50% of the unhindered flux (current condition). Given the boundary conditions they placed on that scenario, 50% doesn't surprise me. What flux (m3/d) from the site to the river did the model calculate for the current condition and for the remedial scenario? The real issue is how accurate are the assumed conditions used in the remedial run? BTW, that's not a truly quantifiable question.

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From: Ford, Robert
Sent: Monday, August 07, 2017 10:40 AM
To: Acree, Steven <Acree.Steven@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Okay. They ran a remedial model scenario in which they essentially shut off surface recharge (infiltration) and a no-flow situation (very low K hydraulic barrier) throughout the entire overburden, such that the only route for water to exchange between the river and land was via bedrock. The model told them that bedrock is transmitting half of the normal flow exchange between the river and the combined overburden-bedrock aquifer.

My concern is that the volume of water exchange between bedrock and river seems very high. So far, they have not mapped an extensive fracture network.

This model result is driving the decision to use a PRB, because it basically tells them there is no way to significantly minimize exchange with the river.

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From: Acree, Steven
Sent: Monday, August 07, 2017 10:50 AM
To: Ford, Robert <Ford.Robert@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

I might believe 50% if we are talking about a scenario using a low K wall around the entire facility to reduce flow through the overburden. However, the actual % will depend on the degree to which a wall could actually be effectively keyed into rock (difficult to do, at best) and the effective K of the rock (a WAG in its truest sense). I seriously doubt flow through rock is currently 50%.

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From: Ford, Robert
Sent: Monday, August 07, 2017 8:04 AM
To: Acree, Steven <Acree.Steven@epa.gov>
Subject: FW: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

FYI – Would you believe that 50% of flow under Aerovox property to the Acushnet River is through fractured bedrock?

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From: Ford, Robert
Sent: Monday, August 07, 2017 8:58 AM
To: Lederer, Dave <Lederer.Dave@epa.gov>
Cc: Dickerson, Dave <dickerson.dave@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Sorry, the attachment I sent last Friday was ORD comments from 2016 review. This time I attached my comments from the 2017 revised Phase III RAP.

However, this was a reminder that the groundwater flow model was previously identified as a source of uncertainty for remedy selection.

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From: Lederer, Dave
Sent: Friday, August 04, 2017 4:42 PM
To: Ford, Robert <Ford.Robert@epa.gov>
Cc: Dickerson, Dave <dickerson.dave@epa.gov>
Subject: FW: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Thanks so much, Rob. I will be in touch after I speak to Dave Dickerson. I am guessing we will be able to find a slot to discuss.

Dave D—want to suggest a time?

From: Ford, Robert
Sent: Friday, August 04, 2017 3:46 PM
To: Lederer, Dave <Lederer.Dave@epa.gov>
Cc: Dickerson, Dave <dickerson.dave@epa.gov>
Subject: RE: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Hi Dave,

Attached is a draft version of my review comments. The attached document also includes review notes that I do not intend to include in a final, draft version.

The biggest issue I find to be problematic at this point is the degree of reliance on the accuracy of modeled groundwater flow. Specifically, the current model indicates that half of the water exchange between the overburden-bedrock aquifer underlying the site and the Acushnet River takes place through bedrock. For me, this does not conceptually align with their presentation of the mapped fracture network.

I know that the reliability of the groundwater model has been criticized previously. To what degree has the model been subjected to review and validation? While it may be late in the game for this step, it appears that the results of groundwater flow modeling exert dominant control on the remedy evaluation. For example, full containment of the overburden aquifer is projected to be unsuccessful, since 50% of all site groundwater is modeled as passing through bedrock. Generally, I find this difficult to believe, although I am willing to be proven wrong.

Can we schedule a time next week on Monday, Tuesday or Wednesday to discuss?

Robert Ford

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From: Lederer, Dave
Sent: Saturday, July 08, 2017 8:10 AM
To: Ford, Robert <Ford.Robert@epa.gov>
Cc: Dickerson, Dave <dickerson.dave@epa.gov>
Subject: FW: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Hi Robert—I spoke to the MassDEP. Our initial deadline is August 11. If you could get us your thoughts maybe by 8/4 that would give us time to integrate them with everyone elses. If this is too tight a schedule or if you have other constraints or problems, please let us know. Thanks!

Dave

From: Lederer, Dave
Sent: Friday, July 07, 2017 12:04 PM
To: 'Gallagher, Angela (DEP)' <Angela.Gallagher@MAssMail.State.MA.US>; 'Martin, Gerard (DEP)' <Gerard.Martin@MassMail.State.MA.US>
Cc: Dickerson, Dave <dickerson.dave@epa.gov>; Wolf, Steven NAE <Steven.Wolf@usace.army.mil>
Subject: AVX Submittal of 6-30-2017 Phase 3 for Aerovox Site

Hi Angela:

Just to memorialize our conversation, EPA is of course very interested in commenting on the above subject document.

Per our conversation we will aim to comment to MassDEP by August 11, 2017. Vacation schedules might require a little more time but

We will aim for 8/11.

Thanks

David Lederer

Team Leader,

New Bedford Harbor Superfund Site

US EPA, Region I

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